

Warnings of local frost were issued for Utah, western Colorado and the mountain districts of New Mexico on the 1st, as relatively high pressure prevailed on the western slope attended by abnormally low temperature. While frost temperatures occurred in places, with freezing weather in northeastern Arizona, a considerable rise in temperature prevented further serious damage. Frost warnings for western Utah were issued on the 13th, when the pressure was low in Rocky Mountain districts and an anticyclonic area was advancing eastward from the middle Pacific. Frost temperatures occurred in localities. On the 22d advices of possibly local frost were issued for western Utah. The center of an area of low pressure occupied the middle Rocky Mountain section, with cooler weather in the Plateau region, frost in Nevada, and rising pressure on the California coast. The rapid development of an area of low pressure of considerable intensity in Nevada was attended by rising temperature.—*Frederick W. Brist.*

SAN FRANCISCO FORECAST DISTRICT.

During the month of June the high-pressure area over the eastern portion of the North Pacific Ocean was slower than usual in gaining strength and stability; consequently it did not impinge on the coast to any great extent till near the end of the month. The result was the formation of irregular-shaped troughs of low pressure over the Rocky Mountain and Pacific States that caused protracted spells of cool and unsettled weather in the San Francisco Forecast District. The passage eastward of these trough-shaped low-pressure areas was more or less checked by the presence of persistent high-pressure areas over the Mississippi Valley and the Atlantic States. This type of weather while difficult to predict was of inestimable benefit to the grain crops, and it did much to prevent the spread of forest fires, which sometimes are numerous at this time of the year, especially in the southern portion of the district.

The only warning issued was for light-to-heavy frost in exposed places in Idaho on the 16th inst. No storm warnings were issued nor were any necessary.—*E. A. Beals.*

RIVERS AND FLOODS.

By H. C. FRANKENFIELD, Meteorologist.

The only great flood of the month occurred in the Arkansas River from the vicinity of Hutchinson, Kans., to the mouth of the river. To the westward, the river was only in moderate flood, and flood stages were not reached except at Fort Lyon, Colo., where the river was above the flood stage of 6 feet on June 17, with a crest stage of 10 feet at 8 p. m.

It is evident that the major portion of this rise came from the Purgatoire River, at Higbee, Colo., on that river, reported the washing out of the river gage on June 17, at a stage of 10 feet, or 6 feet above the flood stage, with the river still rising. Flood warnings for the Arkansas River from Fort Lyon to the Kansas line were issued at once, and no serious damage was reported, as the excess water was apparently diverted to the irrigation canals. Other streams in northeastern Colorado were also in flood.

The following account of the flood from Hutchinson, Kans., eastward was summarized from the detailed reports of Messrs. S. P. Peterson, T. G. Shipman, H. S. Cole, and J. P. Slaughter in charge of the river districts—

Wichita, Kans., Fort Smith, Ark., Little Rock, Ark., and Oklahoma City, Okla., respectively. The rainfall responsible for the floods is shown in the following table:

Rainfall, May 21 to June 17, inclusive, 1923.

Station.	River.	Total for 28 days. Inches.
Macksville, Kans.	Arkansas.	9.31
Great Bond, Kans.	do.	9.90
Hutchinson, Kans.	do.	11.01
Medora, Kans.	do.	12.73
McPherson, Kans.	do.	11.04
Hesston, Kans.	Little Arkansas.	11.93
Newton, Kans.	do.	12.69
Sedgwick, Kans.	do.	13.13
Wichita, Kans.	Arkansas.	18.36
Ralston, Okla.	do.	6.14
Tulsa, Okla.	do.	11.35
Webbers Falls, Okla.	do.	8.52
Emporia, Kans.	Cottonwood.	12.13
Neosho Rapids, Kans.	Neosho.	10.06
LeRoy, Kans.	do.	9.60
Iola, Kans.	do.	8.69
Oswego, Kans.	do.	7.97
Wyandotte, Okla.	do.	12.27
Okay, Okla.	Verdigris.	7.13
Fort Gibson, Okla.	Neosho.	6.96
Camargo, Okla.	North Fork Canadian.	7.97
Union City, Okla.	do.	7.36
Woodward, Okla.	do.	9.53
Canton, Okla.	do.	8.22
Reno Junction, Okla.	do.	5.47
Oklahoma City, Okla.	do.	7.21
Calvin, Okla.	Canadian.	8.80
Fort Smith, Ark.	Arkansas.	8.65
Dardanelle, Ark.	do.	8.24
Danville, Ark.	Petit Jean.	8.25
Little Rock, Ark.	Arkansas.	5.19
Calico Rock, Ark.	White.	8.98
Batesville, Ark.	do.	8.91
Newport, Ark.	do.	12.56
Pine Bluff, Ark.	Arkansas.	6.07
Black Rock, Ark.	Black.	7.71
Patterson, Ark.	Cache.	14.66
Georgetown, Ark.	White.	11.95
Clarendon, Ark.	do.	7.87

It will be seen from the above table that there was a period of almost four weeks of continuous rains over eastern Kansas, Oklahoma, and Arkansas. From May 21 to 24, inclusive, the rains were heavy. On June 9, they were excessive over Kansas and Oklahoma, and on June 10 over Arkansas. The mean rainfall for the 28 days over the three sections mentioned was 9.60 inches, from two to more than three times the normal amount for the season, with the greatest excess over southeastern Kansas.

Hutchinson, Kans., to Wichita, Kans.—The area covered by the heavy rains was about 45 miles in length, 60 miles in width over the upper portion, and 40 miles over the middle portion, converging to about 10 miles at the extreme lower end. The flooded area was about 40 miles in width at Hutchinson, Medora, and McPherson, Kans., and became extensive southward from a line crossing the drainage area through the headwaters of Big Slough and at Hesston, Kans. The total area of farm lands flooded was about 97,000 acres and the reported damage to crops amounted to \$942,000. Damage to highways and bridges amounted to about \$95,000 and to railroads about \$335,250. In the city of Wichita, situated at the convergence of the Big and Little Arkansas Rivers and Chisholm Creek, the damage amounted to about \$840,750, making a total for the district of about \$2,213,000. About 6 square miles of the city was flooded. The crest stage in the Arkansas River at Wichita was 13.5 feet, 4.5 feet above the flood stage and the highest stage of record, and the river was above the flood stage from June 9 to 15, inclusive.

Previous high-water stages were 11 feet on May 18, 1877, 11.2 feet on Jan. 13, 1910, and 12.1 feet on June 6, 1921. The city overflow water came from the smaller